NAVAL POSTGRADUATE SCHOOL
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THESIS

ADPE MAINTENANCE CONTRACTS IN THE MARINE CORPS

by

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December 1981

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This thesis examines the background of ADPE maintenance and its application in the Government. The reasons for the changes within the computer hardware maintenance industry in the last decade are explored and their effects on the Federal Government presented. Three contracts currently in existence in the Government are presented and the performance of the maintenance vendors examined. The presentation of this data will provide

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ADPE Maintenance Contracts in the Marine Corps

by

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ABSTRACT

This thesis examines the background of ADPE maintenance and its application in the Government. The reasons for the changes within the computer hardware maintenance industry in the last decade are explored and their effects on the Federal Government presented. Three contracts currently in existence in the Government are presented and the performance of the maintenance vendors examined. The presentation of this data will provide insight to the reader in regard to different possibilities of hardware maintenance coverage available and tradeoffs that ADP managers must make in determining which coverage is best for their computer center.

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I. INTRODUCTION

A. GENERAL

The computer industry's growth over the last twenty years has brought with it the growth of many subsidiary industries as well. While Automatic Data Processing Equipment (ADPE) maintenance was once considered part of the purchase price of computer hardware and linked the computer user to the Original Equipment Manufacturer (OEM) for the life of the hardware, changes in laws, technology and customer attitudes have allowed for the birth and growth of Third Party maintenance firms. This new addition to the industry has provided a choice when selecting hardware maintenance for a computer system. With a choice, analysis must be performed to weigh the tradeoffs involved in the selection and allow for the best overall decision.

B. OBJECTIVES OF RESEARCH

The objectives of this thesis are to provide a basis for understanding the computer maintenance industry, show the role the Government plays in the industry, and specifically examine the Marine Corps' use of ADPE maintenance.

By providing a brief background of the recent history of ADPE maintenance, of how it got to where it is today, and of its considerable problems, a better understanding of the industry should be attained.

By examining the Government's effect on the industry a better understanding of why the Government makes some of its ADP decisions is possible.

By examining the Marine Corps use of ADPE maintenance, through contracts, data gathering, and interviews, it should be possible to discover if the ADPE maintenance decisions being made by the Marine Corps are the best ones for the Marine Corps.

C. RESEARCH QUESTIONS

There are basically two research questions that have been addressed by this thesis. The first is what are the advantages and disadvantages of OEM and Third Party maintenance contracts and service? The second is under what conditions should the Government agencies, specifically the Marine Corps, use one method over the other?

By answering the first question and then by providing guidance to show what considerations should be taken into account by a particular computer installation, the second question can also be answered.

D. SCOPE

This thesis will explore the administrative aspects of computer hardware maintenance. This will not include the technical side of hardware maintenance but will be limited to a look at different types of hardware maintenance contracts, industry problems, and actual contracts in use in the Marine Corps. This thesis will examine in depth three contracts with the intention of these providing good examples of the majority of ADPE maintenance contracts. The installations used in this study are small compared to many Marine Corps computer installations but the maintenance contracts remain the same as those of the larger installations.

Also, in-house maintenance (that maintenance which is performed by the computer center's own personnel), will not be examined as the Marine Corps does not use it extensively and therefore it represents only a small portion of the Marine Corps' maintenance.

E. METHODOLOGY

The methodology for doing this thesis has been to conduct a thorough research of the literature on the subject

of ADPE maintenance to determine how the hardware maintenance industry got to where it is today. The literature has included both industry related periodicals and government dccuments. The reasons for this background search are to bring to light any problems in the industry and also any gcod aspects in it with a goal of avoiding the problems and taking advantage of the available benefits.

Along with the background study, interviews were conducted with people in the ADPE maintenance industry to get their view of dealing with the Government in this area. The insight of how government regulations affect their service to the Government was sought.

Also, case studies of two Marine Corps installations at Marine Corps Air Station (MCAS) El Toro, California were conducted to get a look at some ongoing actual examples of ADPE maintenance. One of the installaticns uses Third Party and OEM hardware maintenance and the cther uses only OEM hardware maintenance. These studies include interviews with the people involved in receiving the service, a look at the results of that service, and a comparison of the contracts being executed at the installations.

F. LITERATURE REVIEW

The majority of the literature on the subject of ADPE maintenance was found in computer industry periodicals. Other sources included government reports and one thesis prepared for the Air Force about the Air Force's first experience with Third Party maintenance.

The government reports (GAO and Defense Audit Service) deal mostly with determining if the Government's maintenance needs are being satisfied at the lowest cost. A 1968 GAO report suggests that the Government would save a great deal of money if they went to in-house computer maintenance. The Defense Audit Service report shows how one government installation loses money by not paying maintenance bills within a bonus time frame. Another GAO report discusses achieving more competition in the selection of ADP services.

The Air Force thesis evaluated the first use of Third Party maintenance by the Air Force and found that they were generally doing a good job and that more time was needed to make a more complete evaluation.

Books on the subject were scarce and when available only contained short sections on the subject of ADPE maintenance.

G. ORGANIZATION OF STUDY

This thesis is constructed with four chapters, five appendices, a list of references, and a bibliography.

The first chapter deals with the research questions addressed, the scope, the methodology, and the objectives of the thesis.

Chapter II explains the background of ADPE maintenance in general and specifically in the Marine Corps. Federal regulations that affect the selection and administration of hardware maintenance are presented along with industry problems and the future of the industry.

Chapter III is a case study that presents two Marine Corps installations that have different types of maintenance. The missions and workload of these installations are examined and the maintenance support they receive is compared in light of the contracts in place at each location.

Chapter IV contains the conclusions and recommendations based on Chapters I, II, and III.

II. BACKGROUND

A. ADPE MAINTENANCE HISTORY

Since the 1950's the portion of the total Automated Data Processing (ADP) budget expended on hardware has declined from 75% to approximately 30% and is expected to drop as low as 15% by the late 1980's. [Ref. 1: p. 5] As a result of this dramatic change in emphasis with regards to ADP costs, the attention paid tc hardware maintenance costs has also changed. Maintenance costs have not gone down over the same period, and have therefore become a much larger percentage of the total ADP cost, and have commanded a great deal more attention from the ADP manager than in the past. [Ref. 2: p. 78]

Originally almost all computer hardware was leased and maintenance was performed by, or at least paid for by, the lessors. The only maintenance concern of the ADP manager was the availability of the computer for processing and not how it was made available. As technology improved and hardware costs began to decrease, more ADP centers could afford to purchase their own equipment and consequently were required to then purchase their own maintenance. Originally this fact did not upset things, however, because the OEM was

the only one with the capability to maintain his equipment. The maintenance package was normally a part of the purchase agreement and the cost was simply a portion of the purchase cost. Again the ADP manager had little to do in the area of managing ADP maintenance. The only alternative to paying the OEM to maintain his hardware was to train in-house personnel to perform the needed maintenance. The problems with that was that there was still the need of OEM support for the initial and follow-on training required plus the replacement of any parts that may fail. Most managers did not overly concern themselves with the maintenance problem since at that time the maintenance dollar was still a small percentage of the total hardware cost.

As hardware costs continued to decline and maintenance costs increased the ADP manager became more and more aware of the impact on his budget being made by the maintenance expense. This, fact coupled with some legislation by the Government, caused a dramatic change in the ADP maintenance world during the late 1960's.

Public Law 89-306, better known as the Brooks Bill, was perhaps the first major event that lead to the birth of the Third Party maintenance industry. This law, signed in

October of 1965, provided a framework for the economic and efficient acquisition, utilization, and maintenance of general-purpose automatic data processing equipment by government agencies. [Ref. 3: p. 5] With the Government now looking for the best deal it could find when purchasing computers, competition became a reality in the ADP industry. Third Party maintenance firms began entering the maintenance market by offering the Government an alternative to OEM maintenance at 20 to 30% less cost but with comparable service.

The next event to influence the maintenance area was an anti-trust suit against IBM that forced them to make their hardware plug-compatible with other brands. This action in the late 1960's brought about an enormous growth in the number of computer installations with more than one brand of computer hardware (multi-vendor sites). Multi-vendor equipment sites then became the major reason for contracting Third Party maintenance as the need for a singular responsible contractor maintaining the whole suit of hardware instead of one for each brand of equipment. [Ref. 2: p. 78]

The Third Party maintenance industry also got another boost from IBM although in a very roundabout way. Spokesmen from some of the leading firms in the ADPE maintenance field agreed that the market for their services was created by three primary factors and two of those were directly related to IBM's 360 line of mainframes. One was the growing population of third party leasors and end-user owned IBM 360's. The second were programs to extend the useful life of the 360 line by increasing operating speed, adding memory, and applying other new features developed since the 360's were first introduced. [Ref. 4: p. 22]

The addition of non-IBM extended memory to IBM 360's afforded IBM an opportunity to launch a new marketing strategy aimed at discouraging computer installations from holding on to their 360 line of computers. The IBM antitrust consent decree of 1960 allows them to discontinue maintenance on any of their computers that have been substantially altered. Whether or not a computer has been substantially altered is determined if the alterations cause a significant cost increase to IBM in training, tools, or any other facet of maintenance service. By determining that computers with non-IBM extended memory have been

substantially altered, IBM gave themselves an opportunity to cut suppcrt of their 360 computers and pressure the 360 owners into upgrading to one of IBM's 370 line. The strategy did not achieve the desired results, however, because the IBM 360's, augmented with extended memory and other new technology, had virtually the same capacity as the 370's. A computer system that was already paid for and accomplished what the ADP manager wanted turned out to be more attractive to most managers than the newer hardware. With IBM either refusing to provide hardware maintenance for 360's or at least nct providing their best service for 360 installations, another opening was created for Third Party maintenance firms. [Ref. 5: p. 29]

These facts have allowed the Third Party industry to grow from its beginning in the late 1960's to a $250 million a year industry in 1980 and an expected increase to $380 million in 1982. [Ref. 6: p. 61]

B. GOVERNMENT INVOLVEMENT

1. Regulations and Laws

Office of Management and Budget (OMB) Circular A-76. OMB Circular A-76, "Policies for Acquiring Commercial or Industrial Products and Services fcr Government Use"

originally dated August 30, 1967 and updated March 29, 1979, affirms the Governments general policy of reliance on the private sector for goods and services. The Circular states that:

> The Government's business is not to be in business. Where private sources are available, they should be looked to first to provide the commercial or industrial goods and services needed by the Government to act on the public's behalf.

The exceptions to this policy are functions that are governmental in nature and necessarily should be performed by Federal employees and functions that are more economically sound when accomplished by the Government rather than the private sector. When reaching a decision as to whether a task is less expensive when performed by the Government instead of a private source a cost comparison must be completed unless the cost and delay incurred by the conduction of such a comparison outweighs any benefits. OMB Circular A-76 sets forth a cutoff of $100,000 in annual operating costs as the criteria for deciding whether or not to perform the cost analysis. Activities below this threshold should be contracted out to a private source unless in-house performance can be justified as stated before or no private source is available.

The impact of OMB Circular A-76 on ADPE maintenance has been to eliminate the great majority of Government in-house maintenance. For the contracts under $100,000 there is no option except private contracts for non-deployable computer installations and for those contracts greater than $100,000 a cost comparison study will still indicate private sources because of the high cost required to train and retain qualified organic sources.

Service Contract Act (SCA) of 1965. The purpose of the SCA is to provide protection of employees of contractors and subcontractors furnishing services to or performing maintenance service for Federal Agencies. [Ref. 7: p. 15]

Employees covered by the bill must not be paid less than the prevailing rate in the area as determined by the Secretary of Labor.

In 1979, the Department of Labor discovered GSA schedule contracts covering the purchase, lease, and maintenance of ADPE did not contain provisions of the SCA and therefore the SCA was not being applied to computer maintenance. However, when the SCA was incorporated in the 1980 solicitations, strong resistence came from several OEM's and Third Party firms. They refused to accept the SCA

provisions because their technicians were paid based on a relatively low base rate supplemented by merit and incentive pay. They felt that paying the higher Department of Labor directed rate would upset their pay structure. [Ref. 7: pp. 55-56]

After a period of attempting to resolve the problem with the computer industry during which the Department of Labor removed the SCA provisions from the schedule contracts, the problem was temporarily pushed aside when the rate originally established was lowered. [Ref. 7: p. 56]

DOD Directive 4105.55 (Selection and Acquisition of ADP Resources). This directive, although cancelled in August of 1981 because it had served the purpose for which it was issued, explains the areas to be considered when selecting a vendor to provide maintenance service for an installation. The contracts covered in this thesis were all negotiated and agreed upon while this directive was in effect. The following statement on ADPE maintenance services was included in the directive:

> The feasibility and economics of obtaining ADPE maintenance services from any of the various sources (original equipment manufacturer, separate maintenance services contractor, in-house resources, or any combination thereof) will be considered in accordance with the provisions of DOD Directive 4100.15 and DOD Instruction 4100.33. A maintenance exhibit which specifies the economic data necessary to select from alternative maintenance options will be included in each

solicitation document for ADP resources. Some of the factors which should be considered in determining the source of maintenance support are:

a. Operational character of the system;

b. Size and location of the computer installation(s);

c. Impact of split maintenance responsibility;

d. Relative quality of contractual and in-house maintenance support;

e. Experience requirements and training for maintenance personnel; and

f. Cost factors, including amortization of training costs.

The methods of maintaining Government-owned ADPE will be periodically reevaluated in a similar manner, preferably annually, in order to reconsider the feasibility of obtaining maintenance support from alternative sources.

2. Marine Corps ADPE Maintenance

Until 1973 the Marine Corps had relied entirely on in-house and OEM hardware maintenance for their computer equipment. At that time a five year, annually renewable, contract was awarded to Bunker Ramo World Services Corporation, a Third Party maintenance firm. The contract included fourteen non-Fleet Marine Force (FMF) installations. Raytheon Services Company, another Third Party maintenance firm, novated the contract in 1975 and was competitively awarded another five year, annually renewable, contract in 1979. FMF installations have remained under OEM (mostly IBM) contracts during that time because the

installations are deployable and the OEM has been the only one willing to provide support in case of deployment. The Marine Corps was able to use this fact to get a sole source maintenance contract for FMF installations.

As the Marine Corps enters a period where much of its existing equipment will be replaced by new, more sophisticated hardware, Third Party maintenance firms will find it more difficult to compete with the OEM's since finding technicians trained on the new hardware will be difficult. However, the Marine Corps will still keep a large inventory of its older IBM 360 series equipment and the competition for their maintenance will still be open.

Also, the advent of minicomputers into the FMF may bring back the need and feasibility of having in-house maintenance. The distributive nature of minicomputers will make it extremely difficult for non-military personnel to be located in close enough proximity to be responsive to all unexpected hardware failures. The modularity of the hardware produced by the new technology allows for repairs to be performed by personnel with less experience and expertise than a trained vendor customer engineer or trained in-house personnel.

3. Marine Corps Software Needs

The subject of software maintenance, although extremely important in today's computer industry, will not be looked at in great detail in this thesis. The Marine Corps contracts for very little software maintenance above that which comes with the purchase price of new equipment or software products.

New computer systems generally come with the operating system as part of the package and any changes to that software are made at nc extra cost to the installation. On the Marine Corps' older hardware where the OEM no longer maintains the software the systems programmers (in-house) at the different installations make any enhancements or changes to the operating system. Because of all the software maintenance perfcrmed by the systems programmers there probably isn't any vendor who would take over the complete software maintenance.

As for software products purchased by the Marine Corps that dc nct come with the original equipment, they also come with the software maintenance as part of the package. Items such as data base management systems, programming aids, and hardware monitoring packages are often

purchased but only with OEM or in-house software maintenance. The Marine Corps' ADP Management Standards Manual (MCO 5233.1) states that:

> ...in light of the increasing costs of software maintenance, the relative stability of Marine Corps data processing equipment and systems software, the virtually error-free performance of the major vendor software products owned by the Marine Corps, the inability of vendors to identify and quantify specific benefits which the Marine Corps would realize as a result of maintenance agreements, and the capability of Headquarters Marine Corps to provide centralized technical assistance and educational services for vendor software, the blanket purchase of maintenance agreements is no longer considered to be cost beneficial to the Marine Corps.

The Manual further states:

> Software maintenance services will not be procured for any software product that has been owned by the Marine Corps for a period of more than one year.

And also that:

> Procurement of specific software features and enhancements normally offered as part of a maintenance agreement must be subjected to rational cost-benefit analysis. Requests and supporting justification for the procurement of specific features and enhancements to software products will be directed to the Commandant of the Marine Corps.

C. CURRENT ISSUES FACING THE ADP MANAGER

Even with the advent of competition in the computer maintenance industry there has still been a problem with soaring costs. [Ref. 8: p. 38] Besides the cost of parts, which because of new technology have not increased as fast as inflation, the costs of personnel and transportation have increased tremendously over the last ten years. Today an experienced maintenance engineer commands a salary of around

$30,000 a year while a starting figure might be as high as $20,000 for an engineer just out of school. [Ref. 8: p. 38] Because one engineer might service many installations in one geograpical area, travel costs have also become an increasingly large factor in the cost increases.

According to Michael P. Burwen, vice president of Input (a research firm), on the subject of ADPE maintenance:

> As a general case, because the installed base is growing so fast and because the number of trained people is not growing as fast as the installed base, the performance of installed equipment is beginning to degrade. [Ref. 9: p. 61]

This statement highlights the biggest problem facing the industry today; the shortage of trained technicians. The military, once a good place to recruit talented young technicians who had gained valuable experience working on Government hardware and had received industry training at the Government's expense has dried up as a source. What the industry got were personnel with three or four years of hands-on experience with the best training available at no cost to themselves. [Ref. 9: p. 61] Generally the military has given up training their own personnel and gone primarily to OEM and Third Party maintenance. Besides the increased cost of the training, the turnover rate among

these personnel with such a marketable skill was too high. At the present time tactical computers are principally the only ones maintained by military personnel. Technical schools continue to be a source, but even there no one is being trained specifically to repair computer hardware. Vendors must take students with an electronics background and make computer repairmen out of them through the vendors' own training programs.

Another problem that plagues both OEM and Third Party firms is the shortage of repair parts. With the rapidly changing capabilities brought about by new discoveries in the computer field, manufacturers are continually coming out with new models and are not anxious to continue to support their older ones. So while the ADP manager is trying to find ways to extend the life of his already paid for hardware, the OEM is pushing his new line of equipment and no longer manufacturing parts for his old line. While other firms can and do make parts for older machines there is still a tremendous backlog. [Ref. 8: p. 38]

D. FUTURE MAINTENANCE ISSUES

As with any industry most of the new techniques in the computer maintenance field are being developed to solve the existing problems.

The most pressing problem in ADPE maintenance, the manpower shortage, has made the develcpement of methods to reduce the need for the presence of trained technicians imperative. Since the customer engineers must now be responsible for more and more installations, but response time requirements have not changed, methods of easing this task are being developed. Two of the methods, remote diagnostics and self diagnostics, are discussed below.

Remote diagnostics will allow the repairman to get a readout from the computer itself telling him what the problem is and therefore what parts to bring with him. If the problem is something that the personnel at the installation can correct without the technician on-site, he then can correct it cver the phone, with no trip necessary. This type of diagnostics is not entirely new but has never been used with great success.

Self diagnostics will allow installation personnel to make repairs on their own system for problems in areas in which they have been trained and have the parts for. For each system there are some problems that occur more often than others and with a minimum of training the owner of a system cculd learn to maintain his own system in those routine cases.

There are also advances in the technology which are enabling computer manufacturers to build more reliable hardware. Reliable machines that do not break down as often as they used to will solve the majority of the maintenance problems.

III. CASE STUDIES

A. ASC-5

1. Overview

Automated Services Center-5 (ASC-5) is located at MCAS El Toro, California and has two primary missions. The first is to support the base with personnel, supply, and maintenance computer systems. The second, is to support the Navy's Uniform Automated Data Processing System (UADPS) for stock points.

To accomplish these missions ASC-5 has two separate computer systems. For the base systems ASC-5 collects the input data and serves as a Remote Job Entry (RJE) node for MCB Camp Pendleton, California. ASC-5 sends the data to Camp Pendleton, computer to computer, where it is then processed. After being processed at Camp Pendleton the output is then relayed back to ASC-5, computer to computer, where it is distributed. (The RJE concept is used extensively in the Marine Corps where small computer installations are near larger ones and the processing capability of the smaller ones is not enough to perform the required workload.)

The other computer system at ASC-5 is a Navy owned system run by the Marine Corps. This system's hardware is under a separate maintenance contract and is used primarily to support one system. The system, UADPS, is a real-time, on-line control system used to get needed aircraft parts to the units as fast as possible. There is some interface with other hardware that is under the other ASC-5 maintenance contract, but the dependency on that hardware is not critical to meeting the mission of this computer system. The personnel strength of ASC-5 includes six administrators, five programmers, and 29 operators.

2. Workload

The workload of ASC-5 that is RJE'd to Camp Pendleton consists primarily of military pay, civilian pay, military personnel reporting, and MARK IV retrievals against the personnel data base. The pay data includes bond and allotment starts and stops and the reporting of actual pay amounts per individual each pay day. The personnel data includes entries that may affect a Marine's pay and therefore it is important that this information, along with the other pay data, be processed in a timely manner for the morale of the Marines affected. The MARK IV retrievals are

local in origin and are both scheduled and non-scheduled. These reports provide commanders and others with rosters or numbers of Marines in a certain category as is necessary to administer the personnel at MCAS El Toro.

The workload of the other computer system, as stated above, is limited to one mission; the maintenance and repair of aircraft.

3. Equipment

The equipment used to support the RJE function is listed in Appendix C along with the monthly maintenance charge for each piece. This equipment is old and has a limited capability and is covered by a Third Party maintenance contract with Raytheon Service Company.

The other hardware used in supporting the Navy's UADPS is listed in appendix D along with its monthly maintenance charge and is serviced by the OEM, Burroughs Corporation.

4. Backup

In case of a hardware failure at ASC-5 that renders the IBM system inoperable, backup processing will be accomplished at MCB Camp Pendleton. Since all of the software and data files necessary to process ASC-5's

workload are already at Camp Pendleton the only problem becomes getting the input and output back and forth between the two installations. The distance between the two is short and the input and output can be delivered by vehicle. Also the other installation at El Toro (presented later) has RJE capability with Camp Pendleton and may be used to send and receive processing. Since the ASC-5 IBM system has no processing capability of its own, they rely totally on Camp Pendleton being available for processing. Should Camp Pendleton's hardware become unavailable, ASC-5 would have to rely on Camp Pendleton's backup procedure for the processing of it's workload.

A hardware failure of one of the two Burrough's systems at ASC-5 would not cause a total stoppage of their processing although a slowdown would result. In other words the system has the capability of backing itself up. If, however, something happened that disabled both systems, then procedures that have been established would provide continued, although less efficient, service through manual means.

B. 4TH FASC

1. Overview

The 4th Force Automated Services Center (FASC) is a "mobile" computer installation that is designed to be transportable to another location in a short amount of time. It provides data processing support for the 3rd Marine Air Wing located at MCAS El Toro and has a programming staff of 25, an operations staff of 30, and seven administrative personnel. All of the personnel are Marines because of the possibility of relocation for tactical reasons.

2. Workload

The primary workload consists of FREDS, a flight readiness data reporting system that accounts for pilot flight time and training, and 3M which keeps track of airplane maintenance records. Other systems include a supply system and an equipment maintenance system. These last two systems are RJE'd to Camp Pendleton to be processed after which the output is printed at 4th FASC. The workload requires two shifts a day for five days a week with some weekend processing during monthly runs.

3. Equipment

The equipment covered under the maintenance contract applicable to the 4th FASC is listed in Appendix E along with the monthly maintenance charge for each piece. The equipment is located in three places; MCAS El Toro, Ca., MCB Camp Pendleton, Ca., and MCAS Yuma, Ariz.. The main configuration at El Toro is one IBM 360/50 central processing unit, one console, two printers, one tape bank controller with eight tape drives, 28 disk drives, and one card reader/punch.

4. Backup

Backup for the RJE functions at The 4th FASC can be provided by using ASC-5's RJE capability or by transporting input and output between El Toro and Camp Pendleton. The backup of the systems processed at the 4th FASC, however, would entail transporting the software and data files of the systems along with the input to Camp Pendleton since they are not available there.

C. CONTRACTS

This section presents the significant clauses within the three ADPE maintenance contracts in use at the two MCAS El Toro computer installations.

1. ASC-5 Third Party (Contract #N66032-79-D-Z005)

a. Overview

The Third Party maintenance contract for ASC-5 is with the Raytheon Service Company, a national firm that has several data processing related interests besides ADPE maintenance. While the contract is not a General Service Administration (GSA) schedule contract, it is similar in that the Marine Corps negotiates a single contract with Raytheon and then individual delivery orders are written for each installation for their own equipment. This technique eliminates the need to negotiate a separate maintenance contract for each non-FMF installation.

b. Responsibilities of Raytheon Service Company

This contract contains many of the provisions common to the majority of ADPE maintenance contracts. It also includes, however, several quantifiable responsibilities that must be achieved by Raytheon if they are to receive the full remuneration provided for by the contract. These quantifiable responsibilities include system availability and reliability as well as other measures of Raytheon's performance. The provisions for awarding the installation credits based on the performance

of the maintenance vendcr is the key difference between this contract and some CEM contracts such as IBM's to be presented later. The credits provided for by the contract are a form of liquidated damages that accrue to the Government as a result of services either not performed or not performed within a predetermined amount of time. The intent of the credits is to reimburse the Government for probable actual damages and is not tc be construed as a penalty. The Armed Services Procurement Regulation (ASPR), section 1-310 states that not basing the liquidated damages on some actual cr prcbable damage would make it a penalty and therefore unenforcable.

System availability is the amount of time the computer system is available to the installation for desired processing. The system availability standard established by the contract is 96%. Figure 3.1 shows how the system availability percentage is computed and needs very little explanation. The data required for the computation is available from the Incident Reports (IRs) that are completed for each machine failure where the vendor's customer engineer (CE) is called. The term "bona fide attempt" in Figure 3.1 is defined by the contract as one in which the

installation attempts to contact contractor maintenance personnel at the contact point(s) designated by the contractor. The definition of a bona fide attempt at notification is important because the time of notification determines a CE's response time when computing response time credits (explained later). Appendix F shows the amount of credit awarded the Government based on the system availability.

System reliability is the average number of hours between occurrences of system failures and is computed as shown in Figure 3.2. The system reliability determined by the formula is an average number of hours between failures and if less than 72 hours Raytheon begins awarding credits to the Government. Appendix G shows the amount of credit awarded to the Government based on the computed System Reliability for any given month. Data necessary for the formula is also available from the IRs. Major Control Group downtime (MCGD) occurrences are those equipment failures that result in the non-availability to the installation of one or more MCG machines. The contract stipulates which pieces of hardware are included in the MCG and what the percentage of degradation to the entire

$$\text{System Availability} = \frac{\text{O.U.T.}}{\text{Downtime} + \text{O.U.T.}}$$

Operational Use Time (O.U.T.) = MHrs - RMT - SMT - PMT - IT

MHrs = Total number of hours in month
(24 x number of days in month)
RMT = Remedial Maintenance Time
SMT = Scheduled Maintenance Time
PMT = Preventive Maintenance Time
IT = Scheduled Idle Time

Downtime = WCT - RT - WT
(minimum downtime of 0.5 hours per incident)

WCT = Wall Clock Time - total period of time computed from notification of contractor (or 30 minutes after a bona fide attempt at notification) to a return of equipment in an operational condition.

RT = Response Time (on-call or per-call maintenance only) for each incident not to exceed two hours.

WT = Wait Time - the period of time between the arrival of the CE to repair a malfunction and the time that the equipment is made available to him.

Figure 3.1. System Availability Formula

$$\text{System Reliability} = \frac{\text{O.U.T.}}{\text{MCGD} + \text{HIPL} + 1}$$

O.U.T. = Same as O.U.T. for System Availability computation (Fig 3.1).

MCGD = The number of occurrences of MCG downtime within the month.

HIPL = The number of occurrences, during the month, in which any non-MCG hardware failure causes an Initial Program Load to be necessary.

Figure 3.2. System Reliability Formula

computer system that each one's inoperability will cause (Figure 3.3).

This percentage of degradation factor is a recent addition to the contract. The installation was losing all use of the system when a MCG failure occurred, because Raytheon would shut down the entire system even when it was not necessary. Raytheon had no reason to do otherwise, since any MCG failure counted as one occurrence in the reliability formula. Now, however, by using the

2030-F	Processing Unit	100%
1052-6	Printer Keyboard	100%
2821-1	Control Unit	100%
2803-1	Tape Control Unit	100%
1051-N1	Control Unit	100%
2540-1	Card Read Punch	75%
2701-1	Data Adaptor Unit	30%
1081-1	Control Unit	10%

Figure 3.3. MCG Downtime Adjustment Percentages

degradation percentage, minor MCG equipment failure does not necessarily count as one occurrence in the formula and Raytheon is provided with the incentive to keep the rest of the system operative.

Other credits may be awarded the Government under the terms of this contract for poor peripheral maintenance, slow response time, incorrect diagnosis, failure to make mandatory engineering changes, and damaged media. Poor peripheral maintenance is determined if a device remains inoperative due to a malfunction, through no fault or negligence of the Government, for eight consecutive hours. Credits are based on a percentage of the Device Monthly Maintenance Charge (DMMC) of the malfunctioning device. Appendix H provides the percentages that apply to the applicable periods of time. The downtime is computed

the same way as in the system availability computation and should it exceed 200 hours, the credit will be based on the total System Monthly Maintenance Charge (SMMC).

Slow response time applies only to CE response on calls for non-MCG devices since the response time on MCG devices is already a part of the system availability credits. Any response time greater than two hours after notification or a bona fide attempt at notification qualifies the Government for a credit at the rate of $100 per hour or fraction thereof, not to exceed 1/30th of the SMMC per incident. In the case of ASC-5 this translates into $70.46 per incident no matter how long the CE takes because 1/30th of their SMMC is $70.46.

Raytheon will grant the Government a credit in the amount of any services or parts billed to the Government whenever Raytheon incorrectly diagnoses a malfunction. Raytheon will also pay for any extra charges to the Government from other vendors due to the incorrect diagnosis.

Mandatory engineering changes must be installed within 90 days after the first publicly announced date of delivery for non-OEM firms. Failure to accomplish this by

Raytheon will result in a credit to the Government based on a percentage of the affected device's DMMC. A mandatory engineering change is any engineering change designated by the OEM for safety reasons or any engineering change that would be applied by the OEM at no cost had the equipment been under a standard maintenance agreement with the OEM.

Damaged media refers to tape or disk packs damaged by equipment failures. Replacement shall be limited to one per incident and shall be in the form of a credit to the Government in the amount of the cost of replacement.

A final section in the contract on the subject of credits states that in no event shall the Government be granted credits in an amount in excess of the SMMC.

c. Maintenance Entitlements Under Contract

The Basic Monthly Maintenance Charge (BMMC), which equals the sum of all the DMMCs, entitles the Government installation to one Principle Period of Maintenance (PPM) daily, Monday through Friday, excluding Government holidays. The PPM is any nine consecutive hours selected by the Government between 0700 and 1800. There are also options called Extended Maintenance Periods (EMP) available instead of the PPM but ASC-5 only has the PPM option.

On-site maintenance, where the CE remains at the installation during the PPM, is available with this contract but only for installations with a SMMC greater than $3000. ASC-5's SMMC is less than that figure and as a result this contract only provides them with on-call maintenance.

On-call maintenance provides the installation with an unlimited number of calls during the PPM at no additional cost to the Government. On-call maintenance requires a two hour response time by the CE and allows for credits if the two hours are exceeded.

Remedial maintenance (RM) covers that maintenance performed outside the PPM and is charged at a rate of $50 per hour. The Government gets in effect an extended PPM with this contract, however, since it stipulates that no charge shall be billed for RM which either began or for which a request was placed during the PPM or for any RM performed during the PPM. There is also no charge for the recurrence of the same malfunction within a 48 hour period from the completion of the initial RM.

If Raytheon is not able to return the system to the installation in operable condition within twelve hours after the commencement of system downtime, the contractor

shall, if the Government requests, acquire problem diagnosis and maintenance service from the OEM or other qualified source at no additional cost to the Government.

The contract also entitles the Government to a Preventive Maintenance (PM) plan for all equipment covered by the contract. The plan shall include all PM functions to be performed and the frequency and duration of each. The PM shall usually be perfcrmed cutside the PPM and not chargable to the Government.

One of the issues that must be considered by the ADP manager when selecting hardware maintenance that was discussed in Chapter II is the availability of spare parts. This contract provides for the availability of spare parts by requiring Raythecn to maintain an inventory of spare parts and such tcols and instruments necessary to properly and efficiently maintain the ADPE. To insure the ability of Raytheon to acquire the parts, the company must provide the Government copies of Blanket Purchase Orders for spare parts with the OEM whose equipment Raytheon shall be required to maintain or other evidence cf their ability to obtain spare parts. If Raytheon is unable to furnish the evidence, the Government will attempt to assist Raytheon in obtaining the evidence.

d. Perscnnel Requirements

The contract requires that all services under this contract be performed by competent personnel, experienced and highly qualified to provide the necessary services. Throughout the life of the contract, Raytheon shall provide upon request of the Government evidence of the qualifications of personnel performing service under the contract.

There is also a provision that prohibits the use of trainees or cther inexperienced personnel to meet the response time requirements. Rabbits, a term for junior or lightly trained CEs, are sometimes dispatched so the specified response time is met. The green, or inexperienced, rabbit goes through the motions of diagnosing the problem until an experienced CE can be located and sent to the installation. Trainees may be sent out with experienced CEs on maintenance calls, but the Government is not obligated to pay for their services. [Ref. 8: p. 39]

2. ASC-5 OEM (Contract #N66032-80-D-001)

a. Overview

This contract was negotiated and agreed upon with Burroughs Ccrporation to provide, among other aspects,

maintenance service to support activities that acquired ADPE under a "Stockpoints" contract that has since expired. The Department of the Navy originally acquired ADPE under the "Stockpoints" contract for twenty-two systems currently installed at eighteen locations. Delivery Orders are written against this contract to establish maintenance service at the individual installations.

b. Maintenance Service Provided

The Burroughs ADPE at ASC-5 is provided with on-site maintenance covering the PPM. Burroughs provides at least one fully qualified CE and one partially qualified CE at the installation who provide the primary maintenance support for all ADPE including terminals located within thirty miles. On-call maintenance is provided for remedial maintenance (RM) required outside the PPM.

Preventive maintenance will also be provided under the terms of this contract with Burroughs personnel developing and maintaining a preventive maintenance plan that is approved by and available to the Government. The plan will include the breakdown of specific tasks with their duration and frequency.

RM will be performed after ASC-5 has notified Burroughs that the ADPE is not in full operating condition. The designated point of contact, provided to the installation by Burroughs, will make arrangements for its maintenance personnel to receive the notification. If the designated point of contact cannot be reached by the installation then the notification requirement will be satisfied by a bona fide attempt to make contact.

If qualified maintenance personnel fail to arrive at the location of the malfunctioning component within two hours Burroughs will grant the Government a credit for time in excess of two hours. The total credits will be accumulated for the month and adjusted to the nearest hour. A $75.00 rate will be charged for each hour of response time credit, but the amount of credit during any monthly period shall not exceed the total monthly maintenance charge for the installation.

Downtime hours will also start accruing after the two hour response time has elapsed but downtime credits will only be assessed for hours not assessed a response time credit. Figure 3.4 provides the method of determining the amount of downtime credits to be awarded the Government for a particular month.

Hours down in excess of response time	System hour rate	Component hour rate
1	$ 0	$ 0
2	$10	$ 1
3	$25	$ 1
4 - 24	$50	$ 1
> 24	$75	$10

System hour = Any hour or fraction thereof in which system downtime is accrued. (entire system is unavailable)

Component hour = Any hour or fraction thereof in which component downtime is accrued. (system is partially available)

Figure 3.4. Burroughs' Downtime Credit Computation

The contract's explanation of how the downtime credits are computed is somewhat complicated. In the event a component malfunctions and requires RM not only does the downtime credit apply to the malfunctioning component but also any other components made unavailable to the Government as a result of the malfunction. Downtime credits will accrue on each of the down components but will not exceed the maximum system downtime credit of $75.00 per hour. While the explanation of component downtime is reasonably

straightforward the question of what accounts for system downtime is not as clear. The definition of system downtime is provided in the contract as that period of time when all or part of the workload cannot be processed due to a component malfunction. The question of who makes the decision of when the system is down for creditable downtime is also not clear. The contract indicates in the definition of system downtime that the system is declared down when a Government representative so states. However, the next sentence says that the system is up when declared so by a Burroughs' representative. A disagreement in the determination of whether the system is up or down could cause a few problems.

This contract also contains a clause not present in the other two contracts that pertains to program rerun time necessary because of ADPE failure. Time required to recover programs, outputs, and files due to hardware failure, up to a maximum of two hours, will accrue system downtime credits at the applicable rate by adding the time to the accrued downtime.

c. Charges

The monthly charge provided for by this contract is the total of the monthly charges for each piece of equipment. This monthly charge entitles the Government to on-site maintenance during the PPM and as a result of the installation paying for the on-site maintenance the contract allows the installation to receive on-call service outside the PPM at no additional charge.

Other services for which additional charges will not be levied include: preventive maintenance; replacement parts; contractor sponsored modifications; subsequent remedial maintenance to repair the same defect in a component within a twenty-four hour period from the time the component was returned to the Government in full operating condition; and remedial maintenance required within two operational hours after preventive maintenance was performed on the component.

d. Personnel Requirements

The qualifications of personnel performing the maintenance services are outlined in the contract. The minimum qualifications for personnel to be considered fully qualified are:

a) one year of training in a technical school;

b) one year general field experience;

c) two years field experience on a Burroughs' system of the type covered by this contract; and

d) additicnal year(s) in item c) may be substituted for items a) and b).

The contract calls fcr all maintenance services to be performed by fully qualified CEs or at least performed under their supervision. The "green rabbit" clause explained earlier in the sectien on the Third Party contract is also applied in this contract.

Multi-level support, the calling in of a more experienced technician than the regular CE, is provided for by the contract if the regular CE cannot find the cause of the malfunction within four hours. The call for multi-level support is made at the discretion of the Government representative at the installation and shall be provided at no extra cost to the Government.

3. 4th FASC OEM (Contract #M00027-81-F-0299)

a. Overview

The IBM ccntract for ADPE maintenance is a GSA schedule contract that applys to the majority of Government contracts with IBM. The contract contains sections applying to the rental and purchase of general purpose IBM ADPE and its maintenance. Delivery orders are then issued against

the contract for each individual Government installation coming under the basic stipulations of the contract and specify the equipment and its maintenance costs.

b. Responsibilities of IBM

The contract lists eleven subsections under the general section "Responsibilities of IBM". These subsections not only provide the boundaries of service for which IBM is responsible, but also delineates that service which IBM will be responsible for performing but which the Government must pay extra. At least half of this section concerns areas of service that are not the responsibility of IBM.

The scope of the service provided by this contract is the principle aspect of this section. IBM must "provide the availability of maintenance service during Periods of Maintenance Service Availability selected by the Government." The minimum Period of Maintenance Service Availability (same as PPM in other contracts) is any nine consecutive hours between 0700 and 1800 daily, Monday through Friday. The service provided will be that maintenance service necessary to keep the covered ADPE in, or restored to, good working order. This includes scheduled

preventive maintenance, based upon IBM's knowledge of the specific needs of individual machines, and unscheduled, on-call remedial maintenance.

This section continues by stating IBM's policy concerning RM. According to the contract, IBM will commence RM promptly after notification that equipment covered by this contract is inoperative. IBM will provide the installation with a designated point of contact and make arrangements for their CE to receive any notification of hardware failure. The contract further states that "IBM's maintenance personnel will normally arrive at the Government's installation site within two hours after notification by the Government that remedial maintenance is required." If after the CE arrives at the installation and two hours have elapsed without the hardware malfunction being diagnosed and repair begun, IBM will utilize second level technical support (a specialist with more training and experience than the regular CE who specializes in providing diagnostic assistance). In the event that four additional hours elapse after the response of the second level support and there still has been no diagnosis of the malfunction, IBM will utilize third level support (a specialist with

greater experience and training than the regular CE or the second level support specialist).

The maintenance service provided for by the contract also includes parts and the use of tools and test equipment necessary for the restoration of a machine to good working order.

The remainder of this section on IBM's responsibilities deals mostly with areas for which IBM is not responsible. There are nine items that are listed under the subsection entitled "Maintenance service (labor and parts) provided by IBM does not include:". The majority of those nine pertain to damage to hardware as a result of some action not authcrized or overseen by IBM. These actions include: "failure to continually provide a suitable installatien environment", such as electrical power, air conditioning, or humidity control; use of machines for other than data processing purposes; accident, disaster (fire, flood, water, wind, lightening, and others), transportation, neglect, alterations, or attachments; and conversion or removal of an IBM feature.

Other subsections generally refer to IBM's refusal to maintain modified systems and IBM's option to

terminate maintenance service under this contract if the modified systems are not returned to their previous configuration.

c. Charges

The section in the contract that covers charges to the Government for service under the contract has two significant areas. The first and usually most important is the Basic Monthly Maintenance Charge (BMMC) and the second is overtime charges associated with work performed outside of the Period of Maintenance Service Availability.

The BMMC entitles the Government to maintenance service availability during a period selected by the Government. The BMMC is the total of the device monthly maintenance charges for that particular installation and as long as any service performed is during the nine hour period there is no extra charge to the Government.

The overtime charge made for RM calls requires some close monitoring to determine the actual amount charged to the Government. For RM that either began, or for which a call was made, during the Period of Maintenance Service Availability, a one hour grace period beyond the Period will be granted at no additional charge. If the RM is not

completed during the grace period, and with the approval of the installation, IBM will continue the RM at the applicable hourly rate. Also there is a four hour maximum charge on RM calls begun or made during the Period of Maintenance Service Availability.

D. PERFORMANCE ANALYSIS

The following analyses of the contracts are only reflective of the data the researcher was able to attain and applies only to the installations at MCAS El Toro.

1. ASC-5 (Raytheon)

In analyzing Raytheon Service Company's performance under the maintenance contract with ASC-5, data from October 1980 through August 1981 was utilized. The data consisted of the Basic Monthly Maintenance Charge less any credits awarded to the Government for the reasons outlined earlier in this chapter.

With a total BMMC of $2113.75, ASC-5 has paid an average of $1756.11 per month during the eleven month period examined. There were no credits awarded for damaged media during the period and the peripheral downtime credit was only awarded once in the amount of $54.28.

The system availability credit was only awarded three times but one month alone amounted to a credit of $1479.63. The cause for that amount was a persistent problem with a card reader that accounted for the majority of the MCG downtime. A 70% system availability for the month resulted in a 70% credit to the Government.

Six months during the period had credits for excess response time subtracted from the BMMC. The largest amount was $140.92 per month which is a result of two incidents of at least one hour slow CE response to a remedial maintenance call. However, because of the stipulation in the contract that states that the credit for one incident cannot exceed 1/30th of the SMMC, the actual number of hours of late response time was greater.

The most frequent credit awarded during the eleven months was the system reliability credit. Eight of the eleven months had a Mean Time Between Failure (MTBF) of less than 72 hours. The average MTBF for the period was 55.83 hours and is probably more reflective of the advanced age of the equipment rather than the performance of the maintenance contractor.

Interviews with operations personnel at ASC-5 related a confidence in the ability of the CEs from Raytheon and few complaints about their maintenance service as a whole. Their primary complaint concerning maintenance was that when Camp Pendleton was down with maintenance problems, ASC-5 was also unable to operate. The reliance on Camp Pendleton for the RJE function made ASC-5's operability tightly coupled with that of Camp Pendleton.

2. ASC-5 (Burroughs)

The Burroughs Corporation maintenance contract presented earlier only came into force on October 1, 1981 and, therefore, no data is available at this time to evaluate Burroughs' performance with respect to it. The reason it was included in this text was to provide the reader with another contract to compare with those of Raytheon and IBM.

The Burroughs Corporation did, however, provide maintenance service to ASC-5 before October 1, 1981 under another contract and while no data was available on their performance, interviews with ASC-5 personnel indicated that very reliable service was provided by the CEs and consequently few maintenance problems arose.

3. 4th FASC (IBM)

The data available for evaluating the performance of IBM in maintaining the equipment at the 4th FASC is not as extensive as that of ASC-5. Since the IBM contract does not contain all of the contingencies that the other two contracts do, the installation does not keep a record of the same data as ASC-5. The data that was available was from the IRs and consisted primarily of the time the CEs were called, responded, and returned the malfunctioning equipment to the installation.

The most notable statistic attainable from the data is that 30% of the times IBM was called to respond to an equipment malfunction the response time was greater than two hours. As presented earlier, the IBM contract does not provide for credits when a two hour response time is exceeded but simply states that the CE will normally respond within two hours. IBM takes the approach that their CEs know the hardware and systems they maintain well enough to make a decision as to whether a two hour response time is necessary. This policy has caused a problem in a few instances where the CE was called during the Period of Maintenance Service Availability when the cost of the

maintenance would have been covered by the BMMC but the CE arrived in time to correct the problem when overtime charges were in effect. The Contract Officer at Headquarters Marine Corps stated that this problem is not unique to 4th FASC and he has had success in presenting individual cases of this to IBM and receiving a credit in the amount of the overtime charge.

Interviews with operations personnel at 4th FASC also indicated a question on the preventive maintenance (PM) provided by IBM. The contract states that IBM will provide PM on the equipment at 4th FASC based on the CE's knowledge of the equipment. However, IBM has not followed any regular schedule of PM but rather has conducted it only when in the installation performing some other maintenance task. This practice has made it extremely difficult for the installation personnel to keep track of exactly what PM has been performed.

There were no complaints by the operations personnel on the ability of the CEs or on the overall performance of IBM.

IV. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSION

Perhaps the key element to come out of the research for this thesis is that there is an unlimited number of conditions an ADPE maintenance contract can have. Combining different types of maintenance coverage with different methods of charging or different forms of credits allows the ADP manager to find a particular contract suitable to his needs. After analyzing his workload, its volume and criticality, the ADP manager should be able to determine the range of coverage he would like to have for his installation. The mission of the installation may also play an important role in the determination of which contract to sign.

Another aspect apparent from Chapter III is that it may be possible for ASC-5 to accomplish its mission with a maintenance contract that provides less coverage. The fact that ASC-5's system reliability factor was frequently below that called for by the contract and yet they still were able to complete their mission indicates that they may be paying for a higher amount of reliability than is necessary. It is true that the credits awarded the Government because of the

low reliability make the contract payments lower some months but a contract stipulating a lower reliability factor might consistently cost less.

One area not dealt with directly in this thesis was the high level of ability and training in the ADP managers interviewed. Although the majority of them have not been the ADP management field for an extended period of time, their demonstrated capability in handling the functions of directing an ADP installation was prevalent continually.

Finally, the case studies and the background research have shown that the effects of competition in the ADPE maintenance industry have provided ADP managers with much more flexibility than in the past. The advent of Third Party maintenance firms has given the ADP manager an alternative to OEM maintenance that works. The case studies showed that Third Party service is good enough to support installations in completing their mission and that the tailored contracts available because of competition in the hardware maintenance market allow a computer installation to pay only for the service they receive. The final determination of which contract or vendor is better for the Government is almost impossible to make from the data

researched. There are so many variables involved in the maintenance of the ADPE at an installation that comparing different maintenance vendor's performances is difficult.

B. RECOMMENDATIONS

The recommendations will be general in nature and not specifically directed to the installations studied nor the Marine Corps.

1. Analyze Mission and Workload

The primary recommendation is that prior to contracting for ADPE maintenance the ADP manager should conduct a thorough analysis of the mission and workload of his computer system. A thorough analysis will enable the ADP manager to contract only for the service he needs. This is especially important in the Federal Government where the ADP budget is not large enough to allow for over-insuring against hardware maintenance problems. The analysis should be performed prior to the purchase of new ADPE and continued throughout its life because of changes in the mission and workload of the system.

2. Establish Uniform Method of Monitoring

The problem of comparing different contracts and vendors could be eased if a uniform method of monitoring the

maintenance service were established. Agencies that have multiple computer installations should establish and enforce a uniform procedure for collecting and reporting maintenance data such as; downtime, response time, preventive maintenance schedules, and scheduled idle time. Having the same data from each installation would make some comparison possible and enable the agency to evaluate maintenance vendors in light of such data. Along with a uniform reporting method a periodic meeting of installation managers should be held with the subject of ADPE maintenance contracts and service being the topic. Comparing their service and contracts with other similar installations might provide the managers with better insight into managing their own hardware maintenance.

3. Education

The last recommendation is to better educate the installation manager on the subject of the maintenance contract. The installation's parent agency should ensure that its ADP managers know all of the responsibilities of the maintenance vendor and the installation called for by the contract. Proper administration of an ADPE maintenance contract can result in better service and save money.

APPENDIX A

ABBREVIATIONS

ADP - Automated Data Processing.

ADPE - Automated Data Processing Equipment.

ASC-5 - Automated Services Center - 5

BMMC - Basic Monthly Maintenance Charge

CE - Customer Engineer

DMMC - Device Monthly Maintenance Charge

EMP - Extended Maintenance Period

FASC - Force Automated Services Center

FMF - Fleet Marine Force.

GSA - General Service Administration.

IBM - International Business Machines.

IR - Incident Report

MCG - Major Control Group

MCGD - Major Control Group Downtime

MTBF - Mean Time Between Failures

OEM - Original Equipment Manufacturer.

PM - Preventive Maintenance

PPM - Principle Period of Maintenance.

RJE - Remote Job Entry

RM - Remedial Maintenance.

RT - Response Time

SMMC - System Monthly Maintenance Charge

APPENDIX B

DEFINITIONS

Automatic Data Processing Equipment. General purpose, commercially available, mass produced, ADP components and the equipment systems created from them, regardless of use, size, capacity, or price, that are designed to be applied to the solution or processing of a variety of problems or applications and are not specially designed for any specific applications. This definition includes: a) digital, analog, or hybrid computer equipment; b) Auxilliary or accessorial equipment such as plotters, communication terminals, tape cleaners, tape testers, data conversion equipment, disk packs used in rotating storage devices, and source data automation recording equipment (optical character recognition devices, paper tape typewriters, magnetic tape cartridge typewriters, and other data acquisition devices) to be used in support of digital, analog, or hybrid computer equipment; and c) punched card accounting machines used in conjunction with or independently of digital, analog, or hybrid computers.

Automatic Data Processing Equipment Maintenance Services. Those examination, testing, repair, or part replacement functions performed to: a) reduce the probability of ADPE malfunction (preventive maintenance), b) restore a component of ADPE which is not functioning properly in its normal operating status (remedial maintenance), or c) modify the ADPE in a minor way (field modification).

Bona Fide Attempt. The Governments attempt to contact contractor maintenance personnel at the contact point(s) designated by the contractor. If contact cannot be made within thirty minutes after the first attempt to make contact the response time shall start at the end of that time. If contact is made within thirty minutes the response time shall start at time of contact. If the thirty minute limit for contact has expired the Government will continue its attempt to make contact.

Green Rabbit. A junior CE dispatched so the specified response time is met, but once at the installation, only goes thru the motions of fixing the malfunction until a trained CE arrives.

On-Call Maintenance. Contractor provided maintenance service of equipment requested by the Government at a fixed monthly rate regardless of the number of requests for maintenance made by the Government.

On-Site Maintenance. Contractor provided maintenance personnel on duty at the Government's site(s) during the Principle Period of Maintenance.

Preventive Maintenance. That maintenance performed by the contractor on a scheduled basis which is designed to keep components in full operating condition.

Remedial Maintenance. That maintenance performed by the contractor which results from component malfunction. It is performed as required and, therefore, on an unscheduled basis.

APPENDIX C

ASC-5's IBM HARDWARE - MONTHLY MAINTENANCE CHARGES

QUANTITY	EQUIPMENT DESCRIPTION	TOT. AMOUNT
1	2030-F Processing Unit	$ 224.75
1	3237 Decimal Arithmetic	1.50
1	3274 Direct Control	2.25
1	4456 Compatibility Basic	12.00
1	5856 Programmed Mode Switch	1.00
1	6960 1st Selector Channel	26.00
1	6961 2nd Selector Channel	20.00
1	7520 Storage Protection	2.25
1	7915 1051 Attachment	12.00
1	1052-6 Printer Keyboard	108.00
1	2821-1 Control Unit	81.50
1	3615 1100 LPM Print Adapter	1.50
1	5895 Punch Feed Read Control	2.75
1	1403-N Printer	540.00
1	8640 Universal Character Set	2.75
1	2540-1 Card Read Punch	432.00
1	5890 Punch Feed Read	7.00
1	2803-1 Tape Control	33.00
1	3228 Data Conversion	1.50
1	7125 7 Track Compatibility	2.25
1	1051-NI Control Set	12.50
1	3130 CPU Attachment	1.00
1	4409 1st Printer Attachment	.50
1	4409 1st Punch Attachment	.50
1	4409 1st Reader Attachment	.50
1	2701-I Data Adapter Unit	24.75
1	3855 Expansion Feature	9.75

QUANTITY	EQUIPMENT DESCRIPTION	TOT. AMOUNT
1	4636 IBM Line Adapter	$ 2.75
1	4645 IBM Terminal Adapter	10.25
1	7698 Sync Data Adapter Type III	30.75
1	8029 Transparency	1.00
3	2401-3 Magnetic Tape Unit	505.50
2	1051-I Control Unit	24.00
2	1307 Audible Alarm	1.00
2	1313 Automatic EOB	1.00
2	1635 Card Punch Attachment	1.00
2	4408 1st Printer Attachment	1.00
2	4410 1st Punch Attachment	1.00
2	4411 1st Reader Attachment	1.00
2	4605 Home Component Recognition	1.00
2	4770 Keyboard Request	2.00
1	4790 Line Adapter	.50
1	7660 Switch Unit - Model I	.50
2	8715 Vertical Forms Control	4.50
1	1053-1 Printer	13.50
2	1056-1 Card Reader	25.00
1	1640 Card Reader Program	1.00
5	1058-1 Printing Card Punch	162.50

APPENDIX D

ASC-5's BURROUGHS' HARDWARE - MONTHLY MAINTENANCE CHARGES

QUANTITY	EQUIPMENT DESCRIPTION	TOT. AMOUNT
2	B3501 Central Processor	$ 970.00
2	B3730 Floating Point	52.00
6	B3710 Type A, I/O Channel	108.00
6	B3711 Type B, I/O Channel	216.00
2	B3015 150 KB Core Memory	696.00
2	B3003-2 30 KB Memory	186.00
1	B3003-3 30 KB Memory	93.00
2	B3340 Console Printer Control	114.00
3	B9340 Console Ptr Keybd	162.00
2	B3665-19 Speed Adapter 9600 BPS	36.00
2	B3110 Card Reader Control	58.00
1	B9112 Card Reader 1400 CPM	457.00
1	B9916 Validity Check	9.00
2	B3212 Card Punch Control	58.00
1	B9213 Card Punch 300 CPM	400.00
4	B3240 Line Printer Control	116.00
2	B9243-1 Line Printer 1100 LPM	1604.00
2	B9940 High Speed Slew	156.00
2	B9943 Line Printer Memory	80.00
2	B9941 Add'l 12 Print Position	80.00
4	B3395-2 Control for B9495-2	804.00
6	B9495-2 120KB MTU 9 Ch 1600 BPI	1362.00
1	B9499-14 Exchange 4X16	218.00
2	B3393-3 MTU Control 9 Channel	110.00
1	B9394-2 96KB MTU 9 Ch 800 BPI	630.00
2	B3304 Disk Pack Drive Control	106.00
1	B9383-7 Disk Stor/DualCtl 174.4MB	1094.00

QUANTITY	EQUIPMENT DESCRIPTION	TOT. AMOUNT
2	B9486-4 Dual Drive Incr. 174.4MB	$1250.00
2	B3375 Disk File Control	100.00
3	B9376-0 Disk File Storage Unit	1176.00
1	B3376 File Protect Memory	406.00
2	B3376-1 File Protect Memory Control	66.00
1	B3471 Disk File Exchange N1XN2	36.00
2	B3471-5 Disk File Control Adapter	36.00
1	B3471-6 Disk File Elec Unit Adapter	9.00
2	B3353 Multi-Line Control	226.00
1	B3354 Multi-Line Extension	36.00
9	B3665-1 TC500 Line Adapter Direct	162.00
5	B3665-5 TC500 Line Adapter Modem	90.00
1	B3665-18 Speed Adapter 4800BPS	18.00
6	TA 713 Data Set, Free Standing	108.00
6	TC3520-104 Remote Terminal	1122.00
4	A2331-1 80cc Card Controller	28.00
4	B9418-2 Card Reader Punch/Print	1168.00
2	TD831 CRT Display/Ctl Async	108.00
5	TD832 CRT Display/Ctl	270.00
7	TD015-A Alphanumeric Typewrtr Kybd	49.00
2	TD100 Expanded Memory	20.00
1	B874-4 Sys. and Comm. Processor	374.00
1	B0001-40 40K Bytes IC Memory	202.00
1	B074-1 Memory Expn Mod	116.00
1	B074-5 Dual Host Switch	39.00
5	B0551-1 2-Wire Direct Conn Dual	65.00
6	B0551-6 S/Async Data Set Dual Adptr	78.00
2	BX303 B874 Data Comm Processor Ctl	72.00
1	B9410 Periph Switch Unit, Basic	59.00
7	B9410-1 Switch Relay Module	588.00

APPENDIX E

4th FASC IBM HARDWARE - MONTHLY MAINTENANCE CHARGES

QUANTITY	EQUIPMENT DESCRIPTION	TOT. AMOUNT
1	026-1 Alpha Card Punch	$ 89.00
1	1255 Alternate Voice	3.00
4	029-B22 Card Punch	276.00
1	083-1 Scrter	169.00
1	1225 Alpha Sort	18.00
1	2370 Auxiliary Card Count	7.00
1	4015 File Feed	27.00
1	7240 Sorting Suppression	2.00
8	129-3 Card Data Recorder	648.00
1	557-1 Alpha Interpreter	267.00
1	3715 Interpreter Emitter	3.00
1	5555 Print Entry Control	5.00
1	7360 Alpha Interpreter	10.00
2	1416-1 Interchangeable Train Ctg.	236.00
7	3715-2 Printer	1085.00
1	3717-1 Printer	379.00
8	3741-4 Programmable Wcrk Station	2968.00
8	1350 Appl Ctrl Lng Trans	376.00
8	4002 Grcup A	144.00
8	4975 4K Additional Storage	120.00
8	5501 1200 BPS Intgd Modem - Swtchd	200.00
8	6123 Record Insert	40.00
8	6677 Second Disk	512.00
8	7705 Sync Clock	40.00
7	8111 Matrix Print Attachment	35.00
7	8121 3715 Expansion	245.00
1	8123 3717 Expansion	21.00

QUANTITY	EQUIPMENT DESCRIPTION	TOT. AMOUNT
1	2050-I Processor	$1410.00
1	6980 1st Selector Channel	62.00
1	6981 2nd Selector Channel	62.00
1	6982 3rd Selector Channel	62.00
1	7920 1052 Adapter	18.50
1	1052-7 Printer Keyboard	62.78
2	1403-N1 Printer	990.00
2	8640 Universal Character Set	5.00
2	2314-B1 Disk Controller	208.00
2	8170 Twc Channel Switch	7.00
2	2319-B1 Disk Drive	642.00
4	2319-B2 Disk Drive	1284.00
1	2401-3 Magnetic Tape Unit(7 Track)	215.00
7	2401-5 Magnetic Tape Unit	1442.00
7	3471 Dual Density	17.50
1	2540-1 Card Reader Punch	284.00
1	5890 Punch Feed Read	6.50
4	2741-1 Communication Terminal	242.00
1	2803-2 Tape Control	48.00
1	3228 Data Conversion	1.50
1	7135 7/9 Track Compatibility	92.50
1	2821-5 Control Unit	167.00
1	3615 1100 LPM Print Adapter	1.50
1	5895 Punch Feed Read Control	2.50
1	8637 Universal Character Set Adapter	5.00
1	8638 Universal Character Set Adapter	5.00
1	3705-A1 Communications Controller	197.00
1	1301 Attachment, Base Type 1	.50
1	1302 Attachment, Base Type 2	.50
1	1541 Channel Adapter, Type 1	15.50
1	1642 Communication Scanner, Type 2	15.50
2	4650 Business Machine Clock	2.00

QUANTITY	EQUIPMENT DESCRIPTION	TOT. AMOUNT
1	4701 Line Interface, Base Type 1	$ 4.50
1	4703 Line Interface, Base Type 3	3.50
1	4708 Line Interface, Base Type 8	5.50
1	4711 Line Set, Type 1A	2.00
1	4714 Line Set, Type 1D	4.50
1	4732 Line Set, Type 3B	2.00
1	4782 Line Set, Type 8B	9.50
1	2922-1 Controller	156.00
1	1442-5 Punch Adapter	8.00
1	Transparency Text Mode	.50
1	2152 Console Keyboard Adapter	6.50
1	1442-5 Card Punch	141.00
1	2152-1 Printer Keyboard	112.00
1	2922-2 Printer	292.00
1	2922-3 Card Reader	59.00

APPENDIX F

System Availability Credits

% Availability	Credit
96.0 - 100.0	0%
95.0 - 95.9	5%
94.0 - 94.9	10%
93.0 - 93.9	15%
92.0 - 92.9	20%
91.0 - 91.9	30%
90.0 - 90.9	40%
85.0 - 89.9	50%
75.0 - 84.9	60%
0.0 - 74.9	70%

APPENDIX G

System Reliability Credits

Mean Time Between Failures	Credit
Greater than 72 hours	0%
48 to 71 hours	5%
24 to 47 hours	10%
12 to 23 hours	20%
Less than 12 hours	30%

APPENDIX H

Extended Downtime of Peripherals Credits

Hours Downtime	Credit
8 - 12	2% of DMMC
13 - 24	5% of DMMC
25 - 48	10% of DMMC
49 - 99	25% of DMMC
100 - 200	50% of DMMC
200 - 299	5% of SMMC
300 and greater	15% of SMMC

DMMC - Device Monthly Maintenance Charge

SMMC - System Monthly Maintenance Charge

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